<u>REMARKS</u>

The claims have been amended to more clearly define the invention as disclosed in the written description. In particular, claims 1 and 15 have been amended for clarity.

With regard to claims 1-25, the Examiner states "Claims 1-25 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims are directed to a method and apparatus that fail to produce a tangible result. A musical key is determined, notes are identified, etc., but no tangible result is produced."

In response thereto, Applicants have amended independent claims 1 and 15 such that a signal representing the determined key is outputted. As such, Applicants believe that in each case, "a tangible result is produced."

The Examiner has rejected claims 1-25 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,424,486 to Aoki in view of U.S. Patent 6,057,502 to Fujishima.

The Aoki patent discloses musical key determination on the basis of both chord and melody (col. 1, lines 60, 61). A single possible key is nominated on the basis of whether or not a dominant motion is present in a chord progression. When it has been confirmed that the nominated possible key is also not inconsistent with the melody, the possible key is made confirmed key (col. 3, lines 11-15). The dominant motion means a chord progression from the dominant seventh chord to the tonic chord (col. 3, 43-45). Key determination is carried out by detecting a dominant section in

connection with the chord progression and by examining the scale notes of provisional new key and last key in connection with the melody (col. 4, lines 62-67).

The Fujishima patent discloses an apparatus and method for recognizing musical chords, in which a time fraction of a musical soundwave is first analyzed into frequency components in the form of a frequency spectrum having a number of peak energy levels; a predetermined frequency range of the spectrum is cut out for the analysis of chord recognition; the cut-out frequency spectrum is then folded on an octave span; the frequency axis is adjusted by an amount of difference between the peak frequency positions of the analyzed spectrum and the corresponding frequency positions of the processing system; and then a chord is determined from the locations of those peaks in the established octave spectrum by pattern comparison with the reference frequency component patterns of the respective cord types.(col. 2, lines 42-56).

The subject invention relates determining the musical key of an audio signal and includes analyzing a signal portion of the audio signal to identify a musical note (page 6, line 1); preferably, the key is determined using identified bass musical notes (page 6, line 2); where at least one musical note has been identified for the portion, the method then determines a strength associated with the musical note or notes. The strength is determined as a function of the amplitude of one or more frequency components of the identified musical note (page 6, lines 8-12). Once the strength associated with each musical note within a

portion has been determined, a data record is generated comprising the identity of the musical note or notes, the strength associated with each note and the identity of the portion (page 6, lines 12-15). This is done for several portions of the audio signal, resulting in a set of data records (page 6, lines 15-20). Within each record, any strength associated with a musical note less than a predetermined fraction of the maximum strength associated with any identified musical note contained in any record with the set of data records is deleted from the data records (page 6, lines 20-25). A first note is determined from the identified musical notes as a function from their respective strength (page 6, lines 27, 28). At least a second and a third note are selected as a function of the first note (page 6, lines 28, 29). Depending on the musical scale, the first note would represent the tonic of the scale and the second and third notes could represent alternative interval notes corresponding to the major and minor modes of the key (page 6, line 30 - page 7 line 2). Finally, the key is determined by comparing the respective strengths of at least the second and third notes (page 7, lines 3-5, or page 13 lines 10-12).

It is the Examiner's position that Fujishima discloses all of the steps indicated in claim 1 in order to establish a chord, while Aoki may use this determined chord to determine the musical key.

Applicants do not see how the combination of Aoki and Fujishima leads to the claim 1 limitation "determining the key by comparing the respective strengths of the at least second and third

notes". Rather, Applicants submit that the combination of Aoki and Fujishima leads to finding a chord from the locations of peaks in the established octave spectrum by pattern comparison with the reference frequency component patterns of the respective chord types; and using the found chord to establish the key by detecting a dominant section in connection with the chord progression and by examining the scale notes of provisional new key and last key in connection with the melody. Applicants submit that neither of these steps are found in the method of the subject invention, and conversely, the step of "determining the key by comparing the respective strengths of the at least second and third notes" is not found in the combination of Aoki and Fujishima.

Applicants would further like to point out that in Fujishima, separate chords are determined for each of the time segments of the input sound waveform. Hence, each of the steps SM2 – SM7 in determining a chord are performed on a single segment. In the subject invention, the first, second and third notes are selected from the identified musical notes of the plurality of data records, these data records corresponding to the plurality of signal portions.

The Examiner has indicated that Fujishima teaches "determining a first note from the identified musical notes as a function of their respective strengths (column 10, lines 38-41)." This portion of Fujishima actually states:

> "That is, the amplitude levels of the frequency components which correspond to the respective musical note pitches are naturally larger than other frequency

components (the levels of the actually existing notes
are still more so)..."

Applicants submit that it should be apparent that the
above section of Fujishima does not describe determining a first
note but rather indicates that for the musical segment being
analyzed, in the frequency spectrum, those frequency components
which correspond with musical note pitches are larger than other
frequency components. There is no selection/determination of any
one note.

Further, the limitation in claim 1 (and claim 15) states
"determining a first note from the identified musical notes in the
plurality of data records as a function of their respective
strengths". Fujishima is basing its analysis on **one** musical
segment.

The Examiner has further indicated that Fujishima teaches
"selecting at least a second and a third note from the identified
musical notes as a function of the first note (column 10, lines 62-
66)". This portion of Fujishima actually states:

> "Where the tones included in the incoming sound
> waveform are of the notes in the equally tempered
> musical scale, every actual tone used there is
> positioned at a position which is deviated from the
> standard note pitch in the musical scale under the
> reference tone pitch (A4=440 Hz)..."

Applicants submit that it should be apparent that this
section of Fujishima does not describe the selecting of a second
and a third note. Further, this portion of Fujishima is describing
the "fine adjustment of reference pitch" as described in the
flowchart of Figs. 9 and 10. However, it should be noted that this

is part of the peak enhancement processing step – SM5 of Fig. 2 – and, as such, is only performed on a single musical segment at a time when determining the chord.

Claim 1, however, specifically states "selecting at least a second and a third note from the identified musical notes in the plurality of data records as a function of the first note".

Finally, the Examiner states that Fujishima teaches "determining the key based on a comparison of the respective strengths of the at least second and third notes ('502 determines the chord based on a comparison of the respective strengths of the notes (column 7, lines 27-53), and '486 determines the key on the basis of chord information (see: abstract))." This section of Fujishima actually states:

> "As the process moves forward to the step SM5, the crude octave profile P0 is subjected to a peak enhancement processing in order to clearly locate the peaks of the frequency component levels in the frequency spectrum. The peak enhancement processing conducts autocorrelation processing upon the crude octave profile P0 to obtain all enhanced octave profile Q containing more prominently exaggerated peaks. Next, the enhanced octave profile Q is folded (cut and superposed) on a semitone span basis to create a semitone profile S1 exhibiting a unique peak contour. Based on the frequency position of the peak and the shape of the contour of this semitone profile S1, the reference tone pitch of the incoming sound wave is interpreted and the deviation thereof from the reference tone pitch employed (and prevailing) in the data processing system of the apparatus is calculated. The enhanced octave profile Q is adjusted (fine-tuned) in pitch by the amount of the calculated deviation to make a profile PF, which is stored in the predetermined area of the RAM 4.

"The following step SM6 compares the profile PF produced through the above steps SM3-SM5 with the previously prepared chord patterns by means of a pattern matching method and calculates the point representing the degree of likelihood of being a candidate for the chord of the analyzed sound waveform. Then, the step SM7 records the determined chord with the calculated point in the RAM 4 before moving to a step SM8."

Claim 1 (and claim 15) include the limitation "determining the key by comparing the respective strengths of the at least second and third notes".

Applicants submit that it should be clear from the above that Fujishima does not determine the key by comparing the respective strengths of the at least second and third notes.

In view of the above, Applicants believe that the subject invention, as claimed is not rendered obvious by the prior art, either individually or collectively, and as such, is patentable thereover.

Applicants believe that this application, containing claims 1-25, is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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